Name_____ Date_____ Period_____

Worksheet 5.6—The Other Trig Functions

Show all work on a separate sheet of paper. A calculator **is permitted**. Report three decimals and units in all final answers.

Multiple Choice

1. The graph of $y=\cot x$ can be obtained by a horizontal shift of the graph of the graph of $y=$

(A) $-\tan(x+\pi)$ (B) $-\cot\left(x-\frac{\pi}{2}\right)$ (C) $\sec x$ (D) $\tan\left(x-\frac{\pi}{2}\right)$ (E) ~~csc x~~ (E) None of these

2. The graph of $y=\sec x$ ***never*** intersects the graph of $y=$

(A) x (B) x^2 (C) $\csc x$ (D) $\cos x$ (E) $\sin x$

3. If $k\neq 0$, what is the range of the function $y=k\csc x$?

(A) $[-k,k]$ (B) $(-k,k)$ (C) $(-\infty,-k)\cup(k,\infty)$ (D) $(-\infty,-k]\cup[k,\infty)$ (E) $\left(-\infty,-\frac{1}{k}\right]\cup\left[\frac{1}{k},\infty\right)$

4. The function $y=\csc x$ has the same domain as the function $y=$

(A) $\sin x$ (B) $\tan x$ (C) $\cot x$ (D) $\sec x$ (E) $\csc 2x$

5. Consider the functions $f(x)=\tan\frac{\pi x}{4}$ and $g(x)=\frac{1}{2}\sec\frac{\pi x}{4}$ on the interval $(-1,1)$

I. Approximate the interval where $f<g$.

(A) $\left(-1,\frac{2}{3}\right)$ (B) $\left(-\frac{2}{3},1\right)$ (C) $\left(-1,\frac{4}{3}\right)$ (D) $\left(-\frac{4}{3},1\right)$ (E) None of these

II. Approximate the interval where $2f<2g$

(A) $\left(-1,\frac{4}{3}\right)$ (B) $\left(-1,\frac{2}{3}\right)$ (C) $\left(-\frac{4}{3},1\right)$ (D) $\left(-\frac{2}{3},1\right)$ (E) None of these

6. Use the Unit Circle to solve $\cot x=-\sqrt{3}$ on the interval $[-2\pi,2\pi]$.

(A) $\frac{7\pi}{6},\frac{\pi}{6},-\frac{5\pi}{6},-\frac{11\pi}{6}$ (B) $-\frac{4\pi}{3},-\frac{\pi}{3},\frac{2\pi}{3},\frac{5\pi}{3}$ (C) $-\frac{7\pi}{6},-\frac{\pi}{6},\frac{5\pi}{6},\frac{11\pi}{6}$ (D) $\frac{4\pi}{3},\frac{\pi}{3},-\frac{2\pi}{3},-\frac{5\pi}{3}$

7. Use the Unit Circle to solve $\csc x=\frac{2\sqrt{3}}{3}$ on the interval $[-2\pi,2\pi]$.

(A) $-\frac{4\pi}{3},\frac{2\pi}{3}$ (B) $-\frac{2\pi}{3},\frac{4\pi}{3}$ (C) $-\frac{4\pi}{3},-\frac{\pi}{3},\frac{2\pi}{3},\frac{5\pi}{3}$ (D) $-\frac{5\pi}{3},-\frac{2\pi}{3},\frac{\pi}{3},\frac{4\pi}{3}$ (E) None of these

8. What is the period of the function $f(\theta)=\cot\frac{\pi\theta}{8}$?

(A) $P=8$ (B) $P=16/\pi$ (C) $P=8/\pi$ (D) $P=16$ (E) the function is not periodic

9. What is the period of $y = 2\sec\left(\pi - \frac{7}{2}\pi x\right)$?

(A) $P = \frac{4}{7}$ (B) $P = \frac{7}{4}$ (C) $P = \frac{7}{2}$ (D) $P = 7$ (E) $P = \frac{2}{7}$

Short Answer

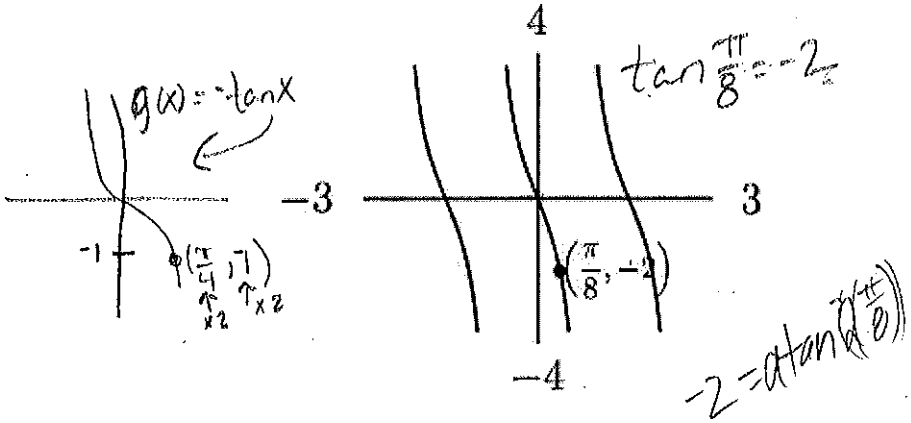
10. The graph at right is for $f(x) = a\tan bx$

(a) Find the value of b.

(b) Find the value of a

$a = -2$

$b = 2$



For 11 through 16, match the trigonometric funcgtion with one of the graphs from I through VI.

11. $f(x) = \tan\left(x + \frac{\pi}{4}\right)$ II

12. $f(x) = \sec 2x$ III

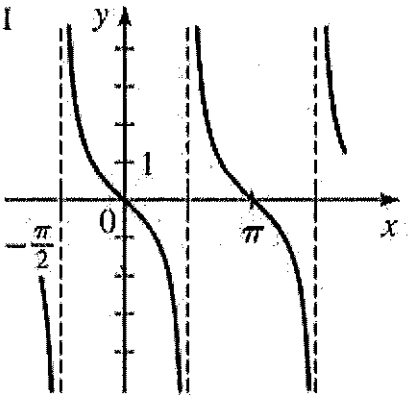
13. $f(x) = \cot 4x$ VI

14. $f(x) = -\tan x$ I

15. $f(x) = 2\sec x$ IV

16. $f(x) = 1 + \csc x$ V

I



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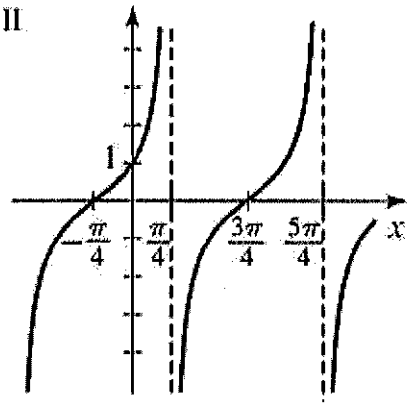
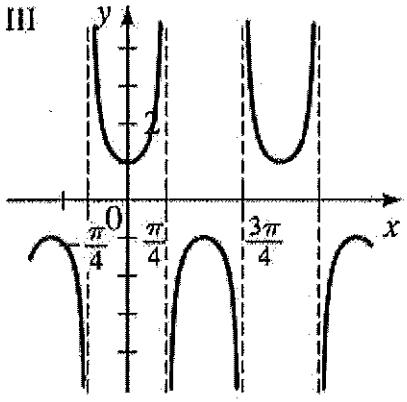


III



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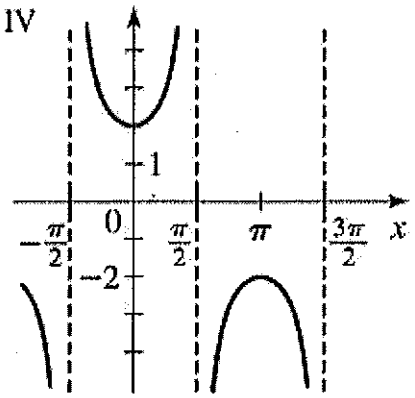

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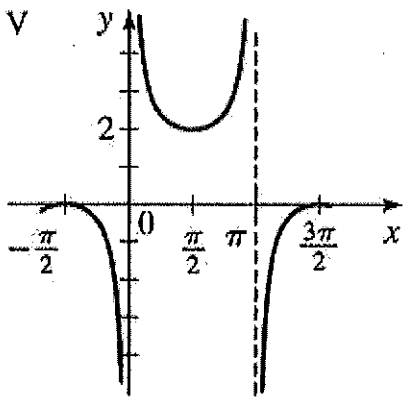
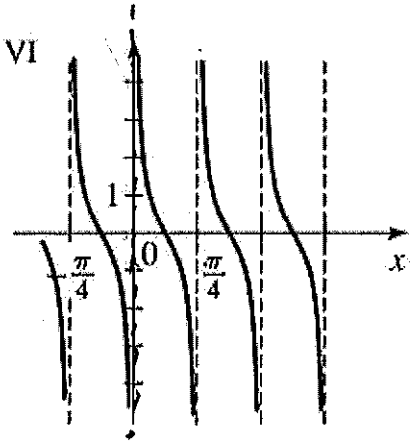


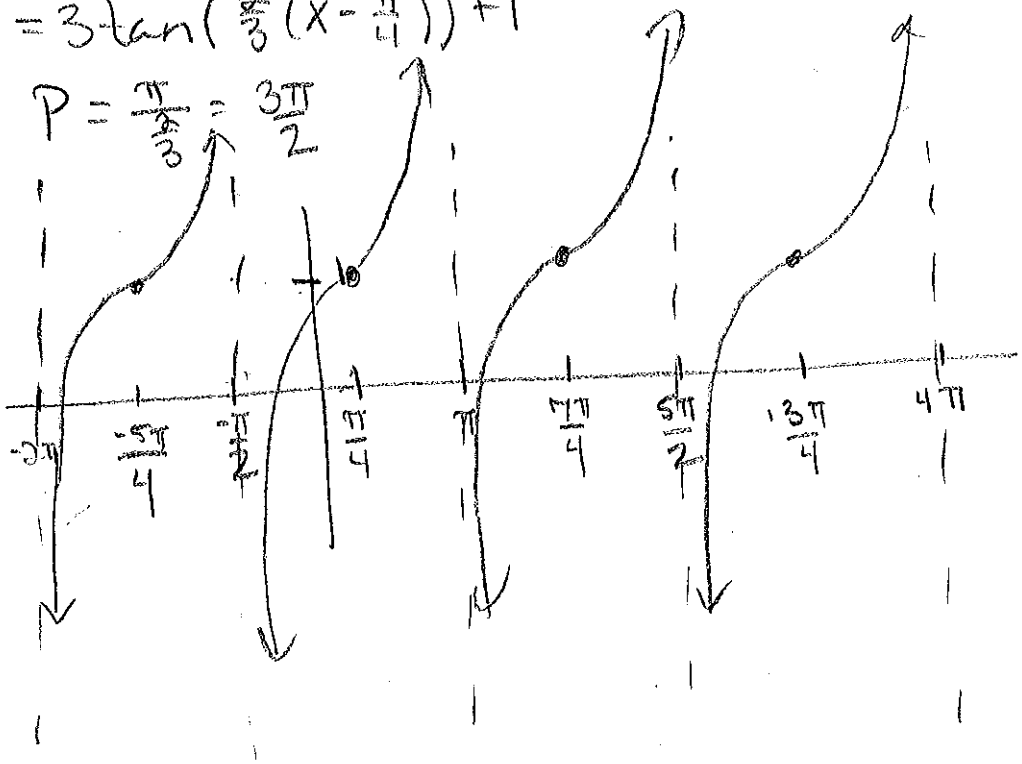
VI



19. $y = 3\tan\left(\frac{2}{3}x - \frac{\pi}{6}\right) + 1$ 20. $y = \frac{1}{2}\cot(\pi - \pi x) + 3$

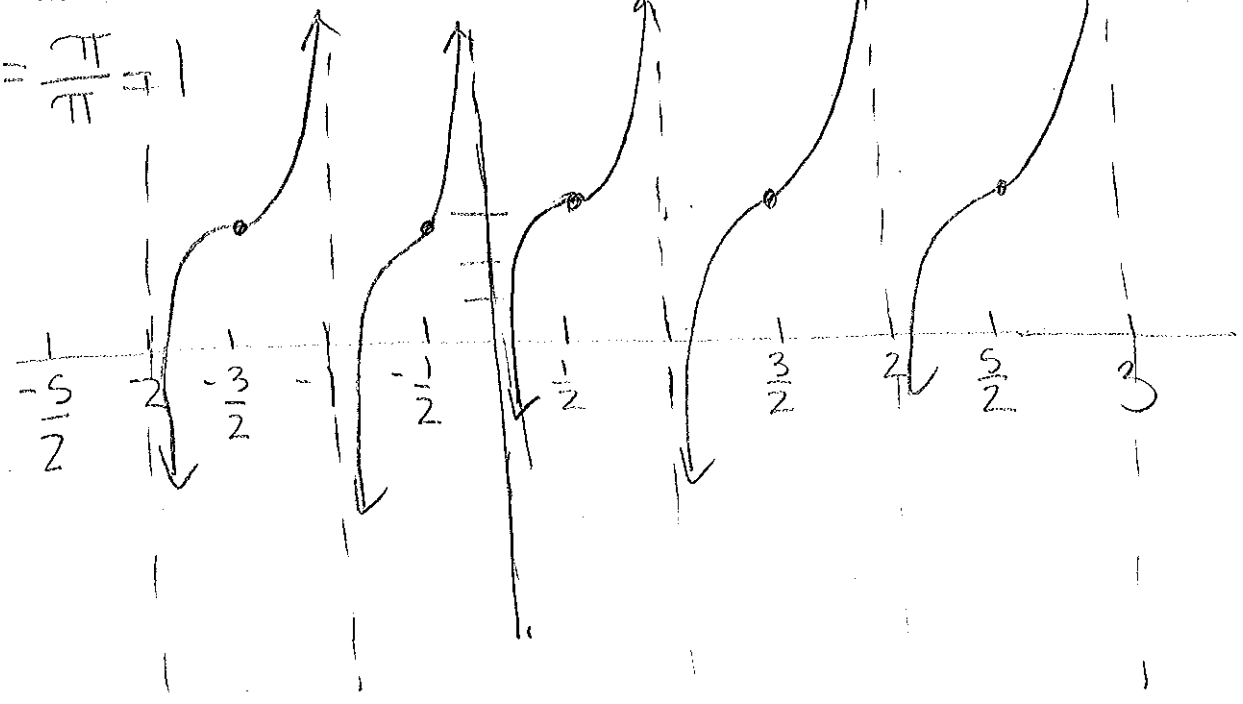
a) $y = 3\tan\left(\frac{2}{3}\left(x - \frac{\pi}{4}\right)\right) + 1$

$P = \frac{\pi}{\frac{2}{3}} = \frac{3\pi}{2}$



20) $y = \frac{1}{2}\cot(-\pi(x-1)) + 3 = -\frac{1}{2}\cot(\pi(x-1)) + 3$

$P = \frac{\pi}{\pi} = 1$

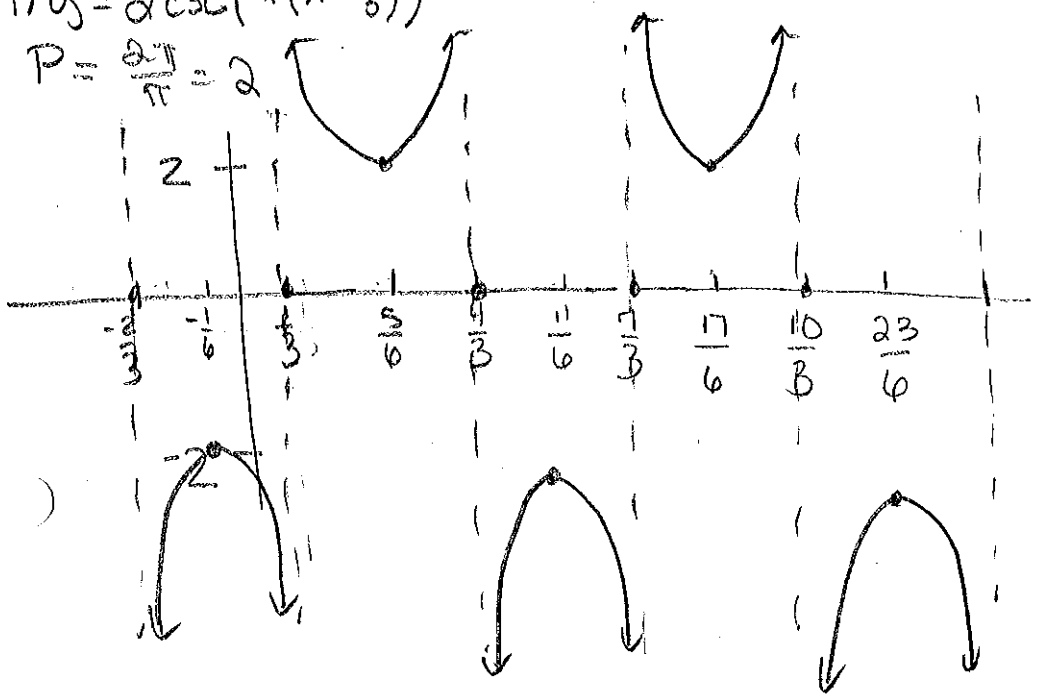


For 17-19 find the period, then sketch at least two cycles of the function. ***Then*** write an equivalent equation of the graph in terms of each function's cofunction.

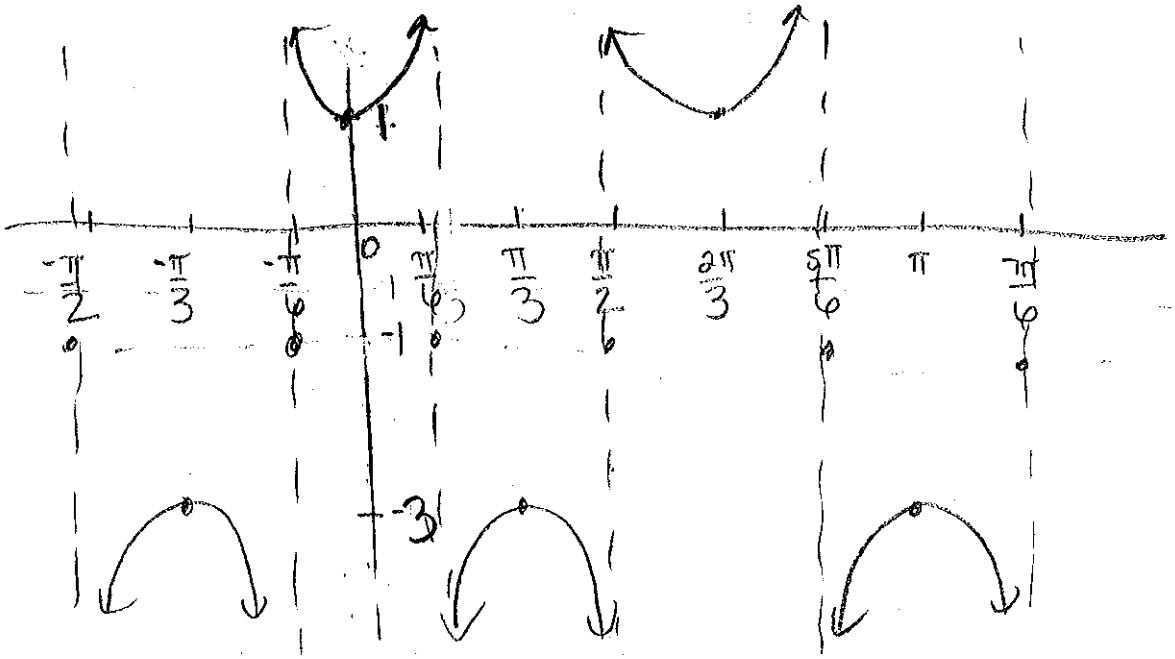
17. $y=2\csc\left(\pi x-\frac{\pi}{3}\right)$ 18. $y=2\csc\left(3x+\frac{\pi}{2}\right)-1$

17) $y=2\csc\left(\pi\left(x-\frac{1}{3}\right)\right)$

$P=\frac{2\pi}{\pi}=2$



18) $2\csc\left(3\left(x+\frac{\pi}{6}\right)\right)-1$ $P=\frac{2\pi}{3}$



21. (Calculator Permitted) On a day when the sun passes directly overhead at noon, a six-foot-tall man casts a shadow of length $S(t) = 6\left|\cot\frac{\pi}{12}t\right|$ where S is measured din feet and t is the number of hours since 6 A.M.

$S(t) = 6\left|\frac{1}{\tan\frac{\pi}{12}t}\right|$

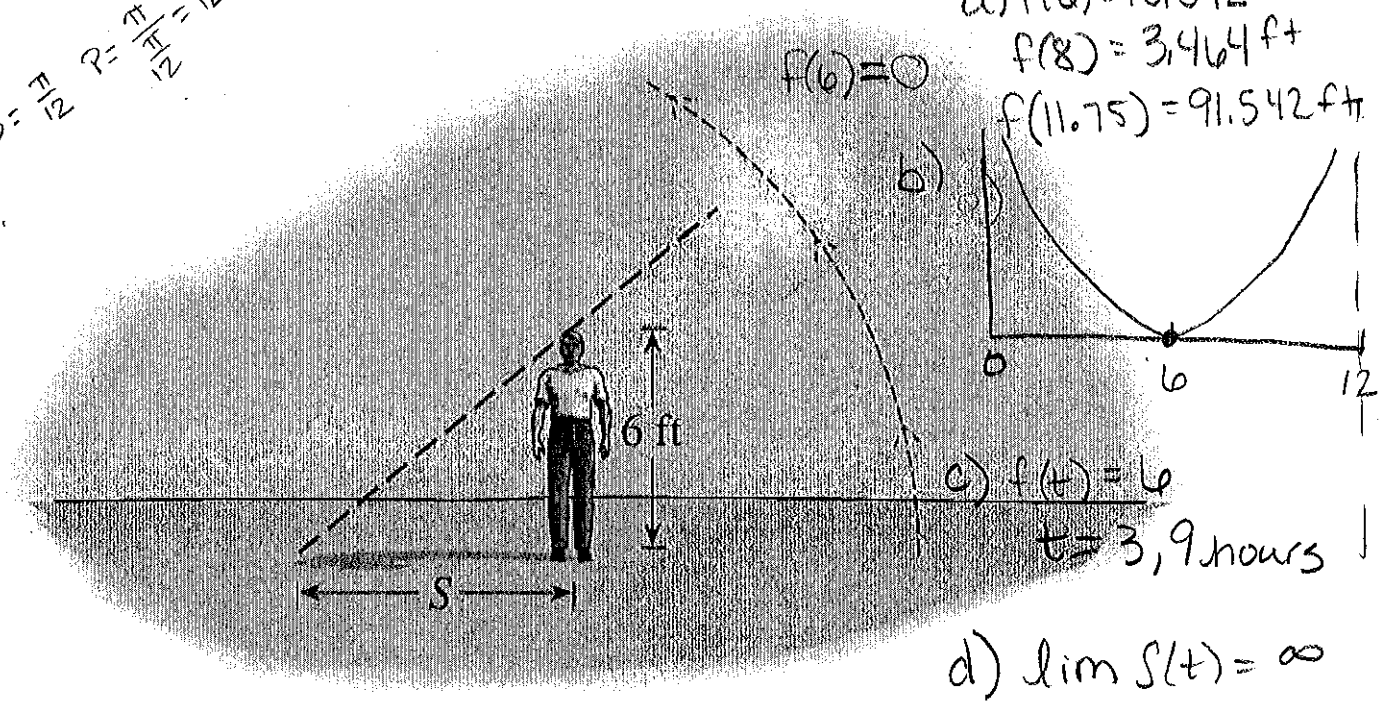
(a) Find the length of the shadow at 8:00 A.M., noon, 2:00 P.M., and 5:45 P.M. Show your set-ups.

(b) Sketch a graph of the function S for $0 < t < 12$.

(c) From the graph determine the values fo t at which the length of the shadow equals the man's height. To what time of day does each of these values correspond?

(d) Explain what happens to the shadow as the time approaches 6 P.M., that is, explain the meaning of $\lim_{t\to 12^-} S(t)$.

$B = \frac{\pi}{12}$ $P = \frac{\pi}{\frac{\pi}{12}} = 12$



a) $f(2) = 10.392$ ft

$f(8) = 3.464$ ft

$f(11.75) = 91.542$ ft

b)

c) $f(t) = 6$

$t = 3.9$ hours

d) $\lim_{x\to 12^-} S(t) = \infty$